



INVESTOR IN PEOPLE

The Patent Office
Concept House
Cardiff Road
Newport
South Wales
NP10 8QQ

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I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation & Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein.

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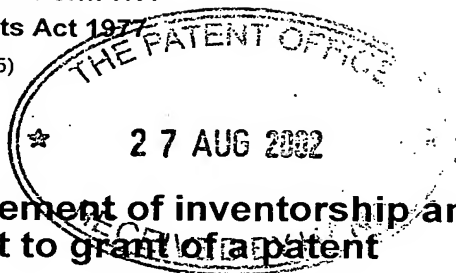
Dated 31 March 2004

Patents Form 7/77

Patents Act 1977

(Rule 15)

**The
Patent
Office**



**Statement of inventorship and of
right to grant of a patent**

The Patent Office

Cardiff Road
Newport
South Wales NP10 8QQ

1. Your reference
1882301/KB

2. Patent Application Number
accompanying application reference 1882301

0219876.0

27 AUG 2002

3. Full name of the or each applicant
Sensopad Technologies Limited

4. Title of the invention
CONCEPT FOR AUTOMOTIVE STEERING WHEELS

5. State how the applicant(s) derived the right from the inventor(s) to be granted a patent
By virtue of the employment of the inventors

6. How many, if any additional Patents Forms
7/77 are attached to this form?
None

7. I/We believe that the person(s) named over the page (and on any extra copies of this form) is/are
the inventor(s) of the invention which the above patent application relates to.

Signature

Beresford & Co
BERESFORD & Co

Date 27 August 2002

8. Name and daytime telephone number of
person to contact in the United Kingdom

BRINCK; David John Borchardt

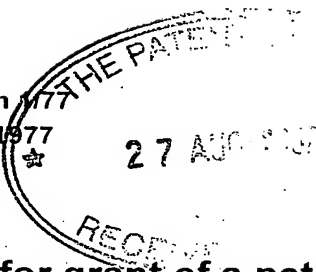
Tel: 020 7831 2290

Patents Form 7/77

MACAULAY; Bruce
c/o Sensopad Technologies Limited
Harston Mill
Harston
Cambridgeshire
CB2 5GG.

HOWARD; Mark Anthony
c/o Sensopad Technologies Limited
Harston Mill
Harston
Cambridgeshire
CB2 5GG

Patents Form 1/77
Patents Act 1977
(Rule 16)



**The
Patent
Office**

Request for grant of a patent

The Patent Office
Cardiff Road
Newport
South Wales NP10 8QQ

1. Your reference **1882301/DJBB**
2. Patent Application Number **0219876.0** **27 AUG 2002**
3. Full name, address and postcode of the or of each applicant (*underline all surnames*)

**Sensopad Technologies Limited
Harston Mill
Harston
Cambridgeshire
CB2 5GG**

Patents ADP number (*if known*)

8157471001

F

If the applicant is a corporate body, give the
country/state of its incorporation

Country: **ENGLAND**

4. Title of the invention
CONCEPT FOR AUTOMOTIVE STEERING WHEELS
5. Name of agent **Beresford & Co**
"Address for Service" in the United Kingdom
to which all correspondence should be sent **2/5 Warwick Court
High Holborn
London WC1R 5DH**
Patents ADP number **1826001**
6. Priority details
- | Country | Priority application number | Date of filing |
|---------|-----------------------------|----------------|
|---------|-----------------------------|----------------|

Patents Form 1/77

7. If this application is divided or otherwise derived from an earlier UK application give details

Number of earlier application

Date of filing

8. Is a statement of inventorship and or right to grant of a patent required in support of this request?

YES

9. Enter the number of sheets for any of the following items you are filing with this form.

Continuation sheets of this form 0

Description 3

Claim(s) 0

Abstract 0

Drawing(s) 0

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Priority documents 0

Translations of priority documents 0

Statement of inventorship and right to grant of a patent (*Patents form 7/77*) 1 + 2 copies

Request for preliminary examination and search (*Patents Form 9/77*) 0

Request for Substantive Examination (*Patents Form 10/77*) 0

Any other documents (*please specify*) 0

11. I/We request the grant of a patent on the basis of this application

Signature

Beresford & Co
BERESFORD & Co

Date 27 August 2002

12. Name and daytime telephone number of person to contact in the United Kingdom

BRINCK; David John Borchardt

Tel: 020 7831 2290

Concept for Automotive Steering Wheels

Version 1.0

Authors – Bruce Macaulay & Mark Howard

1 INTRODUCTION

Sensopad Technologies' Freewheel™ concept uses non-contact inductive sensing technology to produce lower cost controls on automotive steering wheels. The concept's focus is the radical simplification of the steering column's traditional Rotary Coupler. This complex and costly sub-assembly presently carries a large number of connections to and from the various steering wheel controls.

The electronics required to enable inductive communication between the rotating steering wheel and the stationary column also have the capability to control other adjacent elements such as stalk controls and steering column position memory sensors. Furthermore, high accuracy steering angle sensors can be integrated in to the Freewheel™ concept at small incremental cost.

2 AIM

This document aims to provide a technical overview of Sensopad Technologies' Freewheel™ concept for automotive steering wheels.

3 BACKGROUND

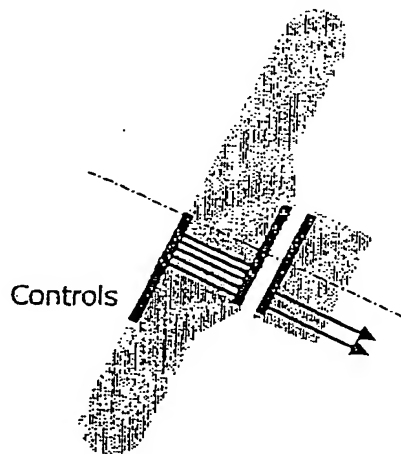
A recent trend in mid to high-end vehicles has been the increasing use of controls on the steering wheel itself in addition to than the more traditional placements of centre console, dashboard or door panel. The most frequent examples are:

- Radio volume, frequency and station controls
- Cruise controls
- Telephone controls
- Climate controls
- (Horn)

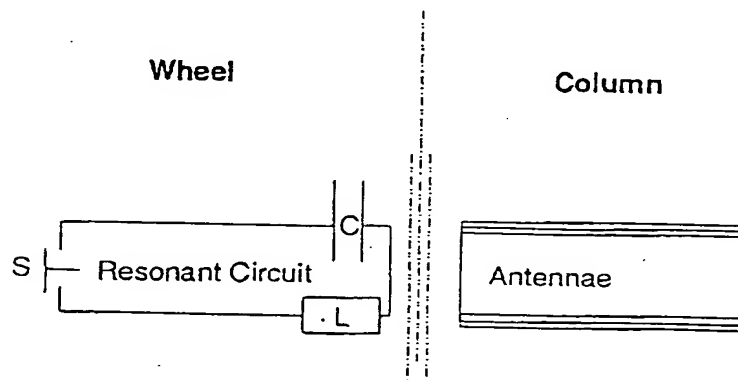
Although consumer feedback has shown to be positive, the provision of such controls comes at a cost to the vehicle manufacturer. A significant part of the cost is the provision of a complex Rotary Coupler sub-assembly in the vehicle's steering column. Further costs have been incurred from reliability problems.

4 FREEWHEEL™ CONCEPT

The Freewheel concept eradicates the need for a physical connection between the rotating steering wheel and the stationary steering column for all but Air bag firing signals. This allows the complexity of the interconnect to be radically simplified.



This is achieved by using inductive non-contact inductive sensing technology. Each switch on the steering wheel still contains a contacting electrical switch but rather than closing a circuit via the Rotary Coupler, the switch closes a resonant LC circuit (or 'puck') of a predefined frequency (or position relative to a known datum). The completion of the resonant circuit is sensed by a local, stationary inductive antennae or 'pad'. Such pads are produced on a small printed circuit board. A single pad may sense several such circuits.



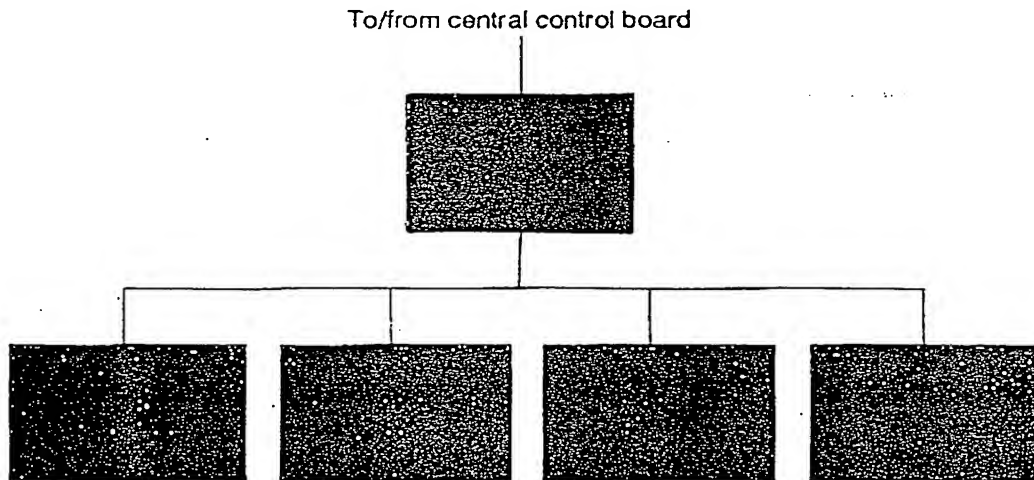
Given the potential for radical simplification, further controls on the steering wheel become economically and technically more feasible, such as lighting or window controls and finger tip operated gear change.

5 BENEFITS

- Reduced costs
- Increased reliability
- Reduced noise and weight
- Greater design freedom (from reduced physical volume requirement) and the passive nature of the Steering wheel mounted controls

6 FURTHER OPPORTUNITIES FOR INCREASED FUNCTIONALITY & REDUCED COSTS

The processing electronics for the steering wheel controls can be used for a variety of additional functions. This provides for a very low cost system since the cost of additional pads and pucks for each sensed position is small.



Since such controls are contactless they provide high levels of reliability and design freedom. Wiring costs are also reduced because only a single serial data interface is required between the processing electronics and the vehicle's central electronic control unit.

Freewheel™ is a Trademark of Sensopad Technologies Ltd

Concept for Automotive Steering Wheels

Version 1.0

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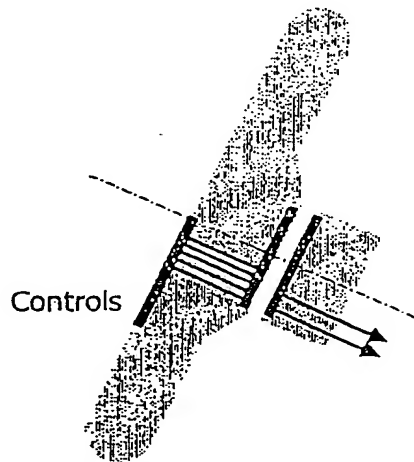
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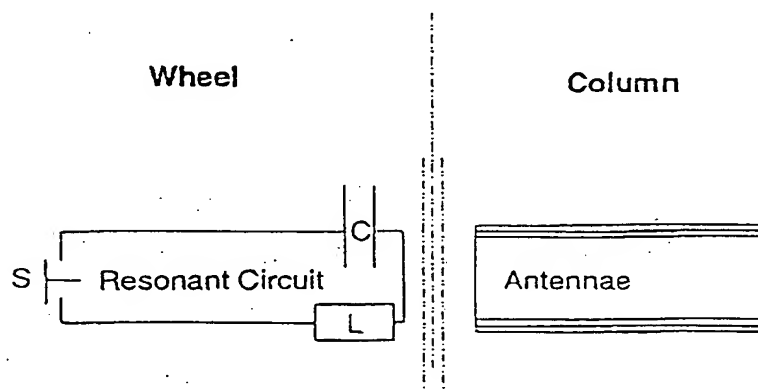
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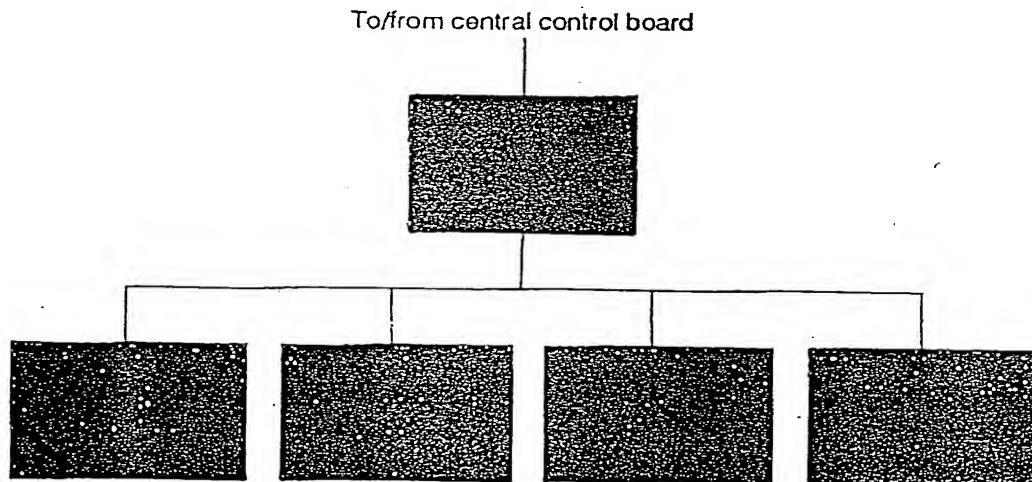
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